Flight Test System for Accurately Predicting Flutter

Innovators at NASA's Armstrong Flight Research Center have developed a method to dynamically predict aeroelastic flutter—the rapid vibrational divergence of wings, tail surfaces, and other sections of an aircraft that can cause severe damage or destruction during flight. The technology uses a combination of real-time flight data and data from a computational model to provide robust margin flutter prediction, enabling an aircraft to avoid an unsafe flutter condition while maximizing aeroefficiency. Armstrong's method may be used for flight testing or post-flight analysis of aircraft flying at or near flutter boundaries. During flight testing, this technology can compute flutter margins at each test point and calculate an optimal flight envelope. The in-flight data is acquired through accelerometers, strain gages, Armstrong's fiber optic strain sensor (FOSS) system (which currently uses ultra-efficient, high-speed algorithms with a processing speed of 100 samples per second), or other structural or aerodynamic sensors, depending on the application and modeling. During post-flight analysis, data sets from multiple test points can be used to determine flutter margins. Armstrong's innovation provides a critical tool to help mitigate aeroelastic instabilities and enable aircraft to perform safely and efficiently.

Benefits

- **Maintains high level of safety:** Predicts a safe flight envelope and enables pilots to respond in real time to aeroelastic instabilities
- **Improves flight test accuracy:** Uses flight data to update the analysis algorithm to accurately account for errors in the computed model
- **Improves flight test efficiency:** Maximizes aeroefficiency based upon current flight conditions and a particular aircraft's flexible characteristics
- **Utilizes FOSS for in-flight data collection:** Monitors the aircraft at a rate of 100 samples per second, enabling real-time calculations of flutter margins

Applications

- Aeronautics
- Aerospace
- Automotive design
- Smart buildings and structural design

Patent

Armstrong has one patent issued (U.S. Patent No: 6,216,063→) for this technology.

Commercial Opportunity

This technology is part of NASA's technology transfer program. The program seeks to stimulate broad commercial use/application of NASA-developed technologies. NASA is flexible in its agreements, and opportunities exist for licensing and joint development. Armstrong is interested in a partnership to commercialize this technology.

Contact Information

If you would like more information about this technology or about NASA's technology transfer program, please contact:

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